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Realizing complex delayed intentions in young and old adults: The role of planning aids

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Although it has been suggested that the delayed realization of intended actions should benefit from appropriate intention planning, empirical evidence on this issue is scarce. In three experiments, we examined whether and which planning aids provided in the intention formation phase affect delayed intention realization in young and old adults. One finding was that intention planning directly affected delayed intention realization: instructing participants to include the cue for appropriate intention initiation in their plans benefited delayed performance. Another finding was that older adults' performance was improved when they were guided in structuring their plan in combination with guidance in implementing this plan after a delay. In sum, the results point to the importance of plan-related factors for understanding the delayed realization of intended actions.

In recent years, research on the nature of cognitive functioning has increasingly concentrated on everyday processes. In this context, a growing body of literature has investigated the process of remembering to carry out intended activities in the future—that is, *prospective memory* (see Brandimonte, Einstein, & McDaniel, 1996; Kliegel, McDaniel, & Einstein, in press, for edited volumes; see also Cherry & LeCompte, 1999; Einstein, McDaniel, Manzi, Cochran, & Baker, 2000; Hicks, Marsh, & Russell, 2000; Kliegel, Martin, McDaniel, & Einstein, 2004).

For the most part, studies on prospective remembering focus on how participants remember to perform a single, isolated act at the appropriate point during the experimental session (e.g., to remember to press a target button in reaction to a specific target word; Einstein & McDaniel, 1990; Guynn, McDaniel, & Einstein, 1998; Marsh & Hicks, 1998; Maylor, 1996; McDaniel & Einstein, 1993; McDaniel, Robinson-Riegler, & Einstein, 1998; Park, Hertzog, Kidder, Morell, & Mayhorn, 1997). However, such paradigms might not fully capture the multiple natures of many everyday prospective memory demands. In everyday life, we are faced with complex situations where we are required to remember to perform not just one or several similar intentions, but rather sets of diverse intentions. Moreover, performance of our intentions is often restricted in terms of order, importance, and time. For instance, we may have to remember to carry out various jobs as best as we can but not really have enough time for each one, in which case we might have to remember to switch between tasks occasionally.

A strategy thought to be important when dealing with the complexity of realizing delayed intentions is planning (see Ellis, 1996; Ellis & Kvavilashvili, 2000). In fact, according to McDaniel and Einstein's (2000) theoretical framework of event-based prospective memory, one important factor in prospective remembering is the planning of the to-be-performed actions (see also models developed by Dobbs & Reeves, 1996; Kliegel, Martin, McDaniel, & Einstein, 2002; Kvavilashvili & Ellis, 1996). Despite these theoretical proposals, empirical evidence concerning the impact of explicit intention planning on performance in prospective memory tasks is scarce as most studies do not include explicit planning requirements in their procedure. However, some studies have demonstrated the benefits of adopting external cues for prospective memory performance in naturalistic tasks (e.g., Maylor, 1990). Other evidence comes from studies that investigated prospective memory in neuropsychological patients with planning deficits or studies in which planning measures were correlated with prospective memory performance (Burgess,

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Veitch, de Lacy Costello, & Shallice, 2000; Cockburn, 1996; Fortin, Godbout, & Braun, 2002; Martin, Kliegel, & McDaniel, 2003; Shallice & Burgess, 1991). These findings largely support the idea that planning ability might benefit prospective memory (but see, e.g., Bisiacchi, 1996, for different findings). Unfortunately, none of these studies directly examined the impact of explicit intention planning manipulations on delayed prospective memory performance.

To explore the issue of complex prospective memory and intention planning, Kliegel, McDaniel, and Einstein (2000) suggested a procedure applying a modified "six-elements task" (SET). In the SET (which was initially proposed by Shallice and Burgess [1991] to assess multitasking and more complex prospective memory performance in neurological patients), participants have to remember to self-initiate six different, open-ended subtasks in a limited time period. Therefore, they have to schedule the subtasks efficiently and keep track of time. Frontal lobe patients usually show pronounced difficulty organizing and executing the intended actions, despite being able to retrospectively recall the content of their intentions (see also Burgess et al., 2000; Groot, Wilson, Evans, & Watson, 2002). Extending the original SET instructions, Kliegel et al. (2000) included the requirements that (1) participants explicitly state a *verbal plan* they intend to follow when working on this multitask set and (2) *delay* the (3) *self-initiated* execution of this plan. Thus, after planning their later performance, participants have to remember to initiate the set of tasks after a delay (*initiation component*) and to remember to switch to all subtasks on their own initiative (*switching component*). Kliegel et al. (2000) found age differences in intention planning in that older adults spontaneously developed less detailed plans than did younger adults, as well as age differences in both delayed performance components. Moreover, both deficits were related, as worse delayed performance was highly correlated with less efficient plans. Thus, appropriate intention planning seemed to lead to better prospective performance and seemed to be associated with the observed (age) group effect. These patterns have recently been largely replicated in other group studies using the modified SET procedure as a multiphase complex prospective memory task and examining middle-aged traumatic brain injury patients (Kliegel, Eschen, & Thöne-Otto, 2004), Parkinson's patients (Kliegel, Phillips, Lemke, & Kopp, 2005), and children with attention deficit/hyperactivity disorder (Kliegel, Ropeter, & Mackinlay, 2006). However, though suggestive, these first (correlational) findings do not definitively establish a direct influence of intention planning on delayed intention realization, nor do they precisely illuminate the locus of the group-related difficulties in complex prospective memory tasks such as the modified SET. To address this question, the present study directly compared planning and execution of the complex prospective memory task in older and younger adults who either did or did not receive planning aids.

Three different planning aids were explored in this study: (1) one targeting the initiation component of the SET, (2) one targeting the switching component, and (3) one general aid to help sequencing one's plan. The planning aid targeting the initiation component instructed participants to include in their plans the cue that determined when they had to start working on the SET. Because participants were already familiar with this cue, as it was part of the general task instructions they had received, this planning aid could be described as elaboration of the prospective memory instruction.

The second type of planning aid was designed to target the switching component and made use of the known effect of cue specificity at encoding upon prospective remembering. It has been shown that both older and younger adults perform more poorly when instructed to respond to items of a semantic category (e.g., pieces of clothing) rather than to a particular category exemplar (e.g., dress; Cherry et al., 2001; Einstein, McDaniel, Richardson, Guynn, & Cunfer, 1995; Ellis & Milne, 1996). Furthermore, two recent studies on the effects of using implementation intentions (Gollwitzer, 1999) in the intention formation phase of prospective memory tasks in samples of older adults have suggested that older adults' prospective memory performance can be boosted by plans that incorporate detailed information about when and where to carry out the future action. In a study by Chasteen, Park, and Schwarz (2001) on event-based prospective memory in older adults, participants who in the planning phase had formed an implementation intention (e.g., "I intend to write *Tuesday* on the top right corner of every sheet of paper I receive") were more than twice as likely to do so at least once than were participants who had merely rehearsed the instruction ("Write *Tuesday* on every sheet of paper you receive"). Liu and Park (2004) found that medical adherence (i.e., the time-based prospective memory task of blood glucose monitoring four times daily for 3 weeks) was improved in older participants who were asked to form implementation intentions while picturing themselves within their respective environment and considering the actions that would lead up to taking their blood measure (i.e., specifying the cue for retrieving their intention). Often, implementation intentions ("If situation/cue *X* arises, perform action *Y*") and instructions used in prospective memory research can seem quite similar if not identical at a basic level of description, but implementation intentions have varied on whether they included overt or covert commitment and/or visualizing (Ellis & McGann, 2005). For the present purposes, however, it may suffice to note that evidence from both research lines suggests that planning aids which increase the specifity of when (prospective cue) to perform the intended action will likely increase performance.

Finally, if we conceptualize intention planning as cognitive processes that generate both (1) *specific strategies* that are developed for the individual aspects of a specific set of intentions (e.g., defining situational and behavioral cues that prompt prospective memory performance, i.e., lower-level planning) as well as (2) a more or less *structured approach to the general problem* of the realization of a set of delayed intentions per se (e.g., resulting in a specific sequence of the intentions, i.e., higher-level planning; cf. Martin & Ewert, 1997; Morris & Ward, 2005), then the first two planning aids would be expected to

target lower-level planning processes. Consequently, the third kind of planning aid used could be viewed as focusing on higher-level planning processes as it was a general technique (flow chart) which did not target plan content, but instead helped structure the plan sequence.

On the basis of the findings and considerations we have outlined, we addressed three questions that extend the existing literature on intention planning and delayed intention realization: (1) Does efficient intention planning using planning aids benefit performance on complex prospective memory tasks? (2) Does guided planning reduce or eliminate age-related differences in delayed prospective performance? (3a) Do participants actually incorporate the contents of the planning aids into their plans? (3b) Can participants recall these plans after a delay? and (3c) To what extent do they actually follow these plans?

EXPERIMENT 1A

The correlation between plan quality and prospective memory performance reported by Kliegel and colleagues (Kliegel et al., 2000; Kliegel et al., 2005) might simply indicate that participants who show good prospective memory are also good planners. Accordingly, it is important to experimentally test whether planning aids directly influence delayed performance in the modified SET. In this experiment, thus, in the intention formation phase, participants were or were not given explicit planning aids.

Of central interest was the detailed investigation of the effect of planning aids on age differences in complex prospective remembering. In previous studies, as noted above, older adults and patients performed significantly worse on the complex prospective memory task than did younger adults, and these effects were associated with older participants' less efficient plans. We hypothesized that older adults' performance on complex prospective memory would benefit from including specific planning cues into the planning phase. Further, should younger adults include such cues in their plans spontaneously (i.e., in the unaided condition), then planning aids might have little impact on younger adults' performances and age-related decrements in complex prospective memory performance might be reduced or even eliminated in the planning-aids condition.

To examine the quality of participants' unaided plans and to determine whether participants actually incorporated the provided planning aids into their plans, we required participants to plan aloud and we recorded these plans. This also allowed us to gauge whether and to what extent participants followed their plans at delayed plan execution (plan fidelity). Finally, retention of the plan subsequent to forming the plan, but prior to plan execution, was evaluated.

Method

Participants and Design. Thirty young (M = 25.0; SD = 5.7; min = 19; max = 40) and 30 older (M = 70.4; SD = 6.3; min = 60; max = 84) adults participated in this experiment (see Table 1 for more details on the samples). Participants completed the procedure in an average time of 75 min. The young participants were undergraduate psychology students who volunteered. The older participants were community dwelling volunteers. Both groups were comparable in sex, self-reported health and educational status. Fifteen participants were tested in each of the 4 conditions specified by the 2 (young vs. older adults) × 2 (no planning aid vs. planning aids) between-subjects factorial design. Within each age group, the participants were assigned randomly to the planning conditions. Analyses of individual-difference measures showed that retrospective memory, working memory, and speed of processing were comparable between the two planning conditions within each age group (all ts < 1).

Materials and Procedure. Following Kliegel et al. (2000), the procedure consisted of three phases: (1) an *introduction phase*, in which the participants were given the task instructions for the modified SET (for details see below) and during which they were either given the planning aids or they were asked to form a plan on their own; (2) a *delay phase*, during which participants were kept busy performing several distractor activities, some of which were included to assess individual-difference variables to control for ability levels across conditions; and (3) a *performance phase*, in which the SET was to be self-initated and executed.

The introduction phase. At the beginning of the experiment, after the general introduction and the informed consent, participants were told that at some point in the experiment they would be asked to fill out a personal participant information form (as noted below, this was the cue for initiating the SET). Participants were informed that this would take place at a later time in the experiment, after some other tasks.

Using example sheets, the tasks and the rules of our modified SET (cf. Shallice & Burgess, 1991, for the original version) were explained to the participant (see Kliegel et al., 2002; Kliegel et al., 2000, for more details). Specifically, participants were asked to carry out six subtasks in a 6-min period of time. The six subtasks

Table 1
Demographics and Individual-Difference Measures Across All Experiments

	Experiment 1A				Experiment 1B				Experiment 2			
	Young Adults (n = 30)		Older Adults (n = 30)		Young Adults (n = 30)		Older Adults (n = 30)		Young Adults (n = 45)		Older Adults (n = 45)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Sex	20 female		21 female		19 female		23 female		31 female		32 female	
Subjective health[a]	4.0	0.70	3.8	0.65	3.8	0.71	3.6	0.77	4.1	0.75	3.9	0.73
Educational status[b]	13.7	0.5	13.3	2.4	13.2	0.6	13.6	2.9	14.9	0.7	14.4	3.0
Free recall[c]	7.6	2.6	3.4	2.1	7.2	2.1	3.8	1.5	7.7	2.0	3.7	2.2
Working memory[c]	55.1	11.3	41.5	12.1	52.5	9.8	43.8	11.9	53.9	11.2	44.8	8.2
Processing speed[c]	62.3	10.6	45.1	7.6	58.8	8.0	48.9	8.2	64.5	12.4	46.7	11.3

[a]Rated on a five-point Likert-type rating scale (1 = *very poor*; 5 = *very good*). [b]Years of education (including school, university, and vocational education). [c]All age group differences in free recall, working memory, and processing speed were significant at $p < .01$.

were divided into two similar sets (sets A and B) of three (word finding, solving arithmetic problems, and writing down the names of pictures). We designed each subtask so that it would need more than 1 min to complete. The two sets of word finding problems (based on a German vocabulary test, MWT-B; Lehrl, 1977) consisted of 35 groups of four items. In each group there was one word and three similarly spelled or sounding pseudowords (e.g., *conceal–concill–cauncil–concel*). The participants' task was to circle the actual words. Each set of arithmetic problems contained 10 problems (e.g., 300/6×4), and both sets were equivalent in difficulty. Finally, the 20 pictures in each set were pictures of common objects or symbols (e.g., a house). Here, the participants' task was to name the pictures with an appropriate label. The participants were told that there was no perfect answer in this subtask, and that they should write down whatever they thought was the best label for the pictures.

After explaining the subtasks, participants were told that they should try to perform as well as possible and that there would be a few rules to follow: Besides the time limit, participants were informed that they would have to remember to work on all six tasks and that they were not allowed to do two subtasks (A) and (B) of the same type in a row.

The participants were tested on recall of the rules, and any errors or omissions were corrected. The experimenter continued to review the task demands until the participants were fully aware of the rules and could recall them perfectly. Then, the participants were told that, in addition, they would have to start these tasks by themselves after answering the question about their date of birth in the participant information form that had been previously explained to them.

Finally, participants were asked to develop a plan for the prospective memory task. Participants were either asked to develop a plan on their own without any guidance ("Please tell me how you intend to perform this task later. Please plan aloud because we want to record your plan."), or they were given specific planning aids before they were asked to develop their plan. In the planning-aids condition, participants were told to consider in their plans to switch tasks after having worked on no more than two items in each subtask (switching-related planning aid; "Please tell me how you intend to perform this task later. Please plan aloud because we want to record your plan. Please consider that in order to be able to work on all six tasks it may be helpful to switch to another task after the first or second item."). In addition, they were advised to consider including in their plans the date-of-birth question in the participant information form for appropriate initiation of the SET (initiation-related planning aid; "In addition, in order to not forget to start the task on your own, please consider that it may be helpful to actually include the date of birth question in your plan. For example, a helpful strategy might be 'I will start the six tasks right after I have given my date of birth. Thus, I will recollect the date of birth question after each assessment during the following experimental session.'"). For planning purposes, they were given all task materials, but they were not allowed to make any notes. Theoretically, a maximum time limit for planning was set at 5 min, which participants were not aware of. However, no participant in the present or the following experiments had to be interrupted while planning, as all participants needed less than 5 min to develop their individual plan. When participants had finished their plan, they moved on to the next task immediately, regardless of how long they had spent planning. In both planning conditions (aided and unaided), planning for the complex prospective memory task had to be verbal and was recorded on a cassette tape. The plans were scored on two components: (1) whether the participant had included the planning aids in his or her plan, and (2) how elaborate the plan was. Plan elaborateness was assessed using a scoring system that included three main features: (1) the number of rules included in the participant's plan (e.g., "Since I'm not allowed to do two tasks of the same type in sequence . . ."), (2) the number of times a participant specified a particular order for performing a task by giving a reason for this step (e.g., "I will do the pictures first, because I think I can do them more quickly . . ."), and (3) the number of executable items of the plan. To assess the number of executable items, we noted how many executable steps the participants indicated—that is, the number of task-steps they planned to initiate (words, pictures, and/or arithmetic problems: 1 point each) and whether the participants specified the steps concerning the version (A or B: 1 point each) and/or the time they planned to spend on each step, or the amount of items they planned to complete in each step (1 point each). The plan elaboration score was the sum of the number of features (described above) included in the plan. The theoretical minimum of the score is 0, which would indicate that the participant did not plan at all. The minimum score for the simplest but correct and complete plan is 7 (e.g., the recorded plan "First, I will do all A-versions and then all B-versions" yields a score of 7 [6 executable items—A, A, A, B, B, and B—and 1 rule included implicitly—Rule 2, "Not performing two subtasks of the same task successively"]). The maximum score is, in principle, unlimited (see Kliegel et al., 2000).

The delay phase. Next, to serve as a distractor activity and to assess individual differences, the participants performed a sentence span working memory task. The test material was taken from Waters and Caplan (1996). In this task, the participants were presented with a series of sentences on the video screen of a computer. They were asked to make a judgment about the acceptability of each sentence in the series, and to remember the last word of each sentence in a series. The dependent measure was the number of correctly recalled last words. This distractor activity lasted about 30 min. Next, participants had to recall their plans for the complex prospective memory paradigm. Plan retention was measured in terms of the accuracy (percentage) of what was recalled relative to the previously stated plan. Mainly to create additional distraction before starting the complex prospective memory paradigm, we also collected measures of speed of processing and retrospective memory. Speed of processing was assessed with the digit–symbol subtask of the Wechsler Adult Intelligence Scale (revised version; Wechsler, 1981). The dependent measure was the number of correctly translated digits in 90 sec. Retrospective memory was administered using a free-recall task (Engelkamp, 1991). The study material for the retrospective memory test was action phrases. There were 16 actions to learn, and each action was presented on a card for 5 sec. The dependent measure was the number of correctly recalled action phrases.

The performance phase. Then, the participants were given the participant information form. After having answered the question about their date-of-birth (which was the third out of nine questions on this form), participants were supposed to initiate the SET on their own (initiation component). If they did not start after having finished the entire questionnaire, the experimenter prompted them to do so and asked if they could recall when they were supposed to have started the six tasks (which all participants were able to do in the present and the following experiments). During SET performance, a clock was provided to all participants to monitor the time. It was set by the participants just before starting on the six tasks or, if they failed to, by the experimenter. After working on the six-elements task for 6 min, participants filled out the rest of their participant information form and were debriefed by the experimenter. Three scores were derived from this phase. First, SET *self-initiation* was assessed by whether participants initiated the SET procedure on their own after having written their date of birth on the participant information form (0 = *not initiated*; 1 = *initiated*). Second, the *switching* performance component was the number of self-initiated switches (out of five possible ones) to the remaining subtasks. Only one switch to each subtask was counted. Finally, we collected a measure of *plan fidelity* (i.e., the accuracy to which participants implemented their original plan). Plan fidelity was computed by comparing the overlap of actually executed items with the executable items of the participant's original plan.

Results

We used 2 (young vs. older adults) × 2 (no planning aid vs. planning aids) between-subjects ANOVAs to examine the influence of planning condition and age on perfor-

mances across the modified SET phases.[1] Unless otherwise indicated, the rejection level for inferring statistical significance was set at .05. Results and *F* values are summarized in Table 2.

Plan elaborateness and content. For plan elaborateness, the ANOVA revealed an age effect approaching significance and a significant effect of planning condition. These main effects were qualified by a significant interaction, indicating that the planning aids increased the elaborateness of the plans only for the older participants ($t = -3.5$, $p < .01$), but not for the younger adults ($t < 1$). Moreover, the planning aids eliminated the age-related reduction in plan elaborateness shown in the no-planning-aid condition (age difference in no-planning-aid condition, $t = 3.2$, $p < .01$, vs. planning aid, $t < 1$). In terms of individual differences, plan elaborateness was significantly related to delayed switching performance ($r = .36$, $p < .01$).

Participants' plans were also analyzed in terms of whether they had actually included the provided planning aids. With respect to the initiation component, the results showed that in the unaided planning condition no older adult spontaneously included the content of the aid, whereas the plans of 2 unaided young adults contained a similar element. In the planning-aids condition, however, 5 young adults and 8 older adults explicitly included the provided planning aid in their verbal plans. This resulted in a significant main effect of planning condition, but neither a significant age effect, nor a significant interaction were found. With regard to the aid targeting the switching component, in the unaided condition 8 young adults and 1 older adult spontaneously included an element similar to the provided planning aid in their individual plan. In the planning-aids condition, 7 young adults and 8 older adults included the content of the planning aid in their plan, resulting in a significant interaction but no significant main effects of age or planning condition.

Plan retention. Plan retention was very high across all four conditions, and the ANOVA revealed no significant effects of planning condition or age.

Delayed SET performance: Initiation component. With respect to the initiation component, a significant main effect of planning condition was revealed, but no interaction with age, indicating that both young and older participants were more likely to initiate the SET when they received an aid on how to improve initiating. In addition, older adults remembered to initiate the prospective memory task significantly less often than did young adults.

Delayed SET performance: Switching component. Regarding the number of self-initiated switches, the ANOVA revealed no significant main effect for planning condition, but there was a significant interaction with age. The means indicate that only older adults' self-initiated switching benefited from the planning aid ($t = -2.6$, $p < .05$, vs. $t < 1$ in younger adults). However, performance for the young adults was already quite high in the no-planning-aid condition. Overall, older adults executed significantly fewer switches than did young adults.

There were no significant main effects of age or planning condition on the total number of attended items within the ongoing subtasks (i.e., number of word finding problems, pictures, and math problems a person attempted during the SET), nor a significant interaction.

Plan fidelity. The fidelity with which participants executed their plan was low, with young adults following just over half of their stated plan and older adults following only about a quarter of the stated elements in their plan. The age-related decline in plan fidelity was significant, and there was neither a main effect of planning condition nor a significant interaction. Relating individual differences in plan fidelity with individual differences in delayed switching performance, however, showed a significant association ($r = .62$, $p < .01$).

Discussion

With regard to the question of whether intention planning using planning aids benefits performance on complex prospective memory tasks, Experiment 1A revealed a planning-aids condition effect on both self-initiated initiation of the SET after the delay, as well as on the number of self-initiated switches within the SET. Although the latter effect only emerged in older adults, for the younger adults high performance levels in switches may have left less room for possible benefits of planning aids. Alternatively, the latter finding might be due to the fact that young

Table 2
Planning and Delayed SET Performance in Experiment 1A

	Young Adults				Older Adults				*F* Values		
	No Planning Aid		Planning Aid		No Planning Aid		Planning Aid				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	Age	Planning Aid	Age × Planning Aid
Plan elaborateness	12.8	6.3	12.2	6.5	6.3	4.7	13.0	5.7	3.56^{+}	4.09*	5.86*
No. who included initiation component in their plan	2		5		0		8		<1	12.83**	2.65
No. who included switching component in their plan	8		7		1		8		2.77	2.77	4.92*
Plan retention	91.1	26.6	88.5	24.9	86.4	32.3	92.9	18.2	<1	<1	<1
Initiation	0.53	0.52	0.73	0.46	0.07	0.26	0.33	0.49	14.43**	4.18*	<1
Switching	4.33	0.98	4.13	1.19	1.33	0.49	2.20	1.21	89.98**	1.64	4.21*
Plan fidelity	63.8	36.3	49.5	34.7	18.2	17.0	33.5	23.8	14.38**	<1	3.33

$^{+}p = .06$. $^{*}p < .05$. $^{**}p < .01$.

adults spontaneously included switching-related elements in their plans (see below).

With regard to the question of whether guided intention planning might eliminate differences between young and older adults in prospective memory performance, the results show that although older adults' performance was improved, age differences in delayed prospective memory were not clearly reduced. Even aided older adults' delayed SET performance was lower than SET performance of unaided younger adults (regarding both the initiation component and the switching component). Thus, the data do not support the idea that providing planning hints that either increase the specificity of prospective memory cues (i.e., when exactly to perform the required actions) or elaborate on when to initiate the prospective task set will suffice to raise older adults' complex prospective memory performance to levels observed in young adults.

Another issue focused on the effects of planning condition on the contents and retention of plans. The results revealed that in the planning-aids condition, the provided hints were incorporated into the plans by some but not all of the participants. However, in the unaided condition, 2 younger adults (but no older adult) stated the date-of-birth cue in their plans as well, and 8 younger adults (and 1 older adult) defined a specific cue of when to switch between tasks. In terms of plan recall, the results show that all (aided and unaided, young and old) participants were able to recall most of their intentions when asked to do so retrospectively. Thus, the data underline previously reported dissociations between impaired prospective memory performance and intact retrospective memory for the intended actions (e.g., Einstein & McDaniel, 1990, 1996; Kliegel et al., 2000). Concerning the fidelity with which participants actually followed their plans, the data reveal that despite good retrospective memory for their plans, when actually performing the SET, participants appeared to (at least partly) deviate from certain aspects of their plans.

Three possible methodological aspects, however, may limit the impact of the results reported. Two issues concern the plan recall measure. First, participants' recall in the middle of the experiment does not necessarily signal whether participants could have in fact recalled their plan at the time of performance. Second, having participants recall their (differentially elaborate) plans prior to performance may have served as a (differentially elaborate) reminder. Third, providing an example suggesting a rehearsal strategy together with the initiation planning aid blurs planning and potential rehearsal effects. Thus, we conducted Experiment 1B to exclude those possible critical issues.

EXPERIMENT 1B

Experiment 1B was mainly conducted to replicate Experiment 1A without the potential intervening variables plan recall prior to performance and prompting a rehearsal strategy.

Method

Participants and Design. Thirty young ($M = 22.8$; $SD = 2.54$; min = 19; max = 30) and 30 older ($M = 69.3$; $SD = 5.03$; min = 60; max = 78) adults participated in this study (see Table 1). Participants completed the procedure in an average time of 73 min. The young participants were undergraduate psychology students who volunteered. The older participants were community dwelling volunteers. Groups were comparable in sex, self-reported health and educational status (see Table 1). Fifteen participants were tested in each of the 4 conditions specified by the 2 (young vs. older adults) × 2 (no planning aid vs. planning aids) between-subjects factorial design. Within each age group, the participants were assigned randomly to the planning conditions. Analyses of individual-difference measures showed that retrospective memory, working memory, and speed of processing were comparable between the two planning conditions within each age group.

Materials and Procedure. The materials and the procedure were identical to those used in Experiment 1A with three exceptions. First, there was no plan recall prior to performance. Second, all participants were asked to recall the task rules and their plans at the end of the entire session. This *final plan recall* was scored in the same way as the first plan retention in the middle of the session. Third, the initiation-related planning aid component did only highlight the aspect of cue inclusion but did not propose an example that suggests a rehearsal strategy ("In addition, in order to not forget to start the task on your own, please consider that it may be helpful to actually include the date of birth question in your plan.")

Results

We used 2 (young vs. older adults) × 2 (no planning aid vs. planning aids) between-subjects ANOVAs to examine the influence of planning condition and age on performances across the modified SET phases.[1] Unless otherwise indicated, the rejection level for inferring statistical significance was set at .05 (see Table 3 for descriptives and test statistics).

Plan elaborateness and content. For plan elaborateness, the ANOVA revealed a significant age effect and a significant effect of planning condition. These main effects were qualified by a significant interaction, indicating that the planning aids increased the elaborateness of the plans only for the older participants ($t = -4.0$, $p < .01$), but not for the younger adults ($t < 1$). Moreover, the planning aids eliminated the age-related reduction in plan elaborateness shown in the no-planning-aid condition (age difference in no-planning-aid condition, $t = 4.4$, $p < .01$, vs. planning aid, $t < 1$). In terms of individual differences, plan elaborateness was significantly related to delayed performance ($r = .39$, $p < .01$).

Participants' plans were also analyzed in terms of whether they had actually included the provided planning aids. With respect to the initiation component, the results showed that in the unaided planning condition one older adult spontaneously included the content of the aid, whereas the plans of 3 unaided young adults contained a similar element. In the planning-aids condition, however, 6 young adults and 7 older adults explicitly included the provided planning aid in their verbal plans. This resulted in a significant main effect of planning condition, but neither a significant age effect, nor a significant interaction were found. With regard to the aid targeting the switching component, in the unaided condition 7 young adults and 2 older adults spontaneously included an element similar to the provided planning aid in their individual plan. In the planning-aids condition, 8 young adults and 9 older adults included the content of the planning aid in their

Table 3
Planning and Delayed SET Performance in Experiment 1B

	Young Adults				Older Adults						
	No Planning Aid		Planning Aid		No Planning Aid		Planning Aid		*F* Values		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	Age	Planning Aid	Age × Planning Aid
Plan elaborateness	13.4	4.0	13.1	4.3	7.2	3.8	13.7	4.9	6.43*	8.05**	9.48**
No. who included initiation component in their plan	3		6		1		7		<1	7.09*	<1
No. who included switching component in their plan	7		8		2		9		1.17	4.67*	2.63
Initiation	0.60	0.51	0.80	0.41	0.13	0.35	0.47	0.52	11.72**	5.21*	<1
Switching	4.26	0.59	4.47	0.83	1.53	0.64	2.87	1.06	109.13**	13.66**	7.47*
Plan fidelity	59.3	29.6	58.7	36.9	21.0	18.1	35.7	22.6	18.04**	<1	1.13
Final plan retention	88.8	20.6	76.3	27.0	87.8	21.3	88.9	19.6	<1	<1	1.42

*$p < .05$. **$p < .01$.

plan, resulting in a significant planning aid effect but not in an interaction or a main effect of age.

Plan retention. Plan retention was very high across all four conditions, and the ANOVA revealed no significant effects of planning condition or age.

Delayed SET performance: Initiation component. With respect to the initiation component, a significant main effect of planning condition was revealed, but no interaction with age, indicating that both young and older participants were more likely to initiate the SET when they received an aid on how to improve initiating. In addition, older adults remembered to initiate the prospective memory task significantly less often than did young adults.

Delayed SET performance: Switching component. Regarding the number of self-initiated switches, the ANOVA revealed a significant main effect for planning condition, as well as a significant interaction with age indicating that only older adults' self-initiated switching benefited from the planning aid ($t = -4.2$, $p < .01$, vs. $t < 1$ in younger adults). However, again, performance for the young adults was already quite high in the no-planning-aid condition. Overall, older adults executed significantly fewer switches than did young adults.

There were no significant main effects of age or planning condition on the total number of attended items within the ongoing subtasks (i.e., number of word finding problems, pictures and math problems a person attempted during the SET), nor a significant interaction.

Plan fidelity. The fidelity with which participants executed their plan was again low, with young adults following just over half of their stated plan and older adults following only somewhat more than a quarter of the stated elements in their plan. The age-related decline in plan fidelity was significant, and there was neither a main effect of planning condition nor a significant interaction. Relating individual differences in plan fidelity with individual differences in delayed switching performance, however, showed a significant association ($r = .69$, $p < .01$).

Discussion

In sum, data largely replicate findings of Experiment 1A indicating that all three possibly critical issues are not likely to have influenced data reported in Experiment 1A. First, delaying plan recall after SET performance also revealed high retrospective memory for the plan across all conditions. This supports the conclusion that the storage of the plan seems to be rather unproblematic for both young and old adults and that it is independent of the complexity of the plan. Second, even when excluding the externally prompted plan rehearsal prior to performance, the pattern of results remains the same. This underlines the importance of the planning stage for the observed performance effects. Third, the initiation effect remained even when the initiation-related planning aid focused on the mere inclusion of the cue and omitted the example suggesting a rehearsal strategy, arguing against a mere rehearsal explanation of the effects observed. Moreover, receiving the switching-related planning aid (in both Experiments 1A and 1B) cannot be discussed in terms of simple rehearsal of intention, because there was no previous information about switching in the general task instructions that could be rehearsed in the first place (controls who did state explicitly when/how they would switch had derived this from the given rules, resulting in individual switching components [e.g., switch after 1 min]). One might still argue that there is also the possibility that giving the planning aids generally prompted more (covert) rehearsal of the intentions, maybe because those intentions were perceived as more important than others. From a more general conceptual perspective, this type of rehearsal, however, could be understood as a part of the planning process (which in theory comprises also monitoring/execution of a plan), helping to keep the intentions in working memory until their execution, or helping monitoring for appropriate situations to execute them. Taken together, Experiment 1B argues in favor of a planning effect and against a reminder or rehearsal interpretation. Experiment 2 will thus extend our investigation of the role of planning in complex prospective memory.

EXPERIMENT 2

Experiment 2 had two major purposes. The first was to extend the investigation of intention planning manip-

ulations to more general, task-nonspecific planning aspects. One might argue that because both planning aids in Experiments 1A and 1B were specific to the task and targeted just two out of several task problems (namely, the prospective problems), they might not have stimulated the act of intention planning per se. Accordingly, in the present experiment, we implemented a planning aid that provided general techniques to help structure intentions. We compared the effectiveness of this aid with that of an aid that combined both the general structuring aid and the switching-related planning aid.

The second purpose was to further investigate the obtained age differences. First, we combined the approach from Experiments 1A and 1B on plan retention by assessing plan retention during the delay phase and collecting data on participants' plan recall at the very end of the experimental procedure. Second, we examined whether the comprehensive planning aid that comprised both general planning strategies targeting the structure of a set of intentions and a specific strategy targeting the switching component of the prospective memory task might eliminate the age differences in realizing delayed intentions.

Method

Participants and Design. Forty-five young ($M = 23.2$; $SD = 3.26$; min = 18; max = 30) and 45 older ($M = 65.6$; $SD = 4.78$; min = 60; max = 81) adults participated in this study (see Table 1). Participants completed the procedure in an average time of 80 min. The young participants were undergraduate psychology students who volunteered. The older participants were community dwelling volunteers. Groups were comparable in sex, self-reported health and educational status. Fifteen participants were tested in each of the 6 conditions specified by the 2 (young vs. older adults) $\times$ 3 (no planning aid vs. general planning aid vs. combined aid—i.e., general plus specific planning aids) between-subjects factorial design. Within each age group, the participants were assigned randomly to the planning conditions. Analyses of the individual-difference measures showed that retrospective memory, working memory, and speed of processing were comparable between the three planning conditions within each age group.

Materials and Procedure. The materials and the procedure were identical to those used in Experiment 1A with three exceptions. First, as in Experiment 1B, all participants were additionally asked to recall the task rules and their plans at the end of the entire session. Second, a *general*, task-nonspecific planning aid was given to the participants in both planning conditions. This general planning aid was a visual planning scheme in form of a one-dimensional flow chart that contained a vertical sequence of distinct boxes in which participants had to fill in the sequence of steps of their plan. Participants were instructed to use this visual scheme to structure and sequence their plans (cf. Friedman, Scholnick, & Cocking, 1987; Morris & Ward, 2005; "Please tell me how you intend to perform this task later. Please plan aloud because we want to record your plan and please use this planning scheme that will help you to structure your plan"). After participants had developed their plans with the aid of this scheme in the planning phase, they were not allowed to look at the scheme again during the rest of the experimental session. Third, the planning aid for switching was *only the switching-related aid* from Experiment 1 (i.e., after working on the first two items of a subtask, consider switching to next subtask).

In the no-planning-aid condition, participants were required to plan on their own. In the general-planning-aid condition, participants were asked to plan on their own by using the flow chart, and in the combined-aid condition, participants were asked to plan on their own using the flow chart and considering the cue that specified when to switch between tasks.

Results

We used 2 (young vs. older adults) $\times$ 3 (no planning aid vs. general planning aid vs. combined aid) between-subjects ANOVAs to examine the influence of planning aids and age on performances across the modified SET phases.[1] Unless otherwise indicated, the rejection level for inferring statistical significance was set at .05. Results and F values are summarized in Table 4.

Plan elaborateness. For plan elaborateness, the ANOVA revealed a significant age effect, and a significant effect of planning condition. Both of these main effects were qualified by a significant interaction, indicating that the planning aids increased the elaborateness of the plans only for the older participants, and only for those in the combined-aid condition (for older adults, no aid vs. combined aid, $t = -3.9$, $p < .01$; for all other single comparisons, $t < 1$). Moreover, the combined planning aid eliminated the age-related reduction in plan elaborateness shown in the no-planning-aid and the general-planning-aid conditions (age differences for no aid, $t = 3.1$, $p < .01$; for general aid, $t = -3.1$, $p < .01$; for combined aid, $t < 1$). In terms of individual differences, plan elaborateness was again significantly related to delayed performance ($r = .32$, $p < .01$).

Analyzing the inclusion of plan elements targeting the execution component corroborated the results. Significant main effects of age and planning condition were found, again qualified by a significant interaction. In the no-planning-aid condition, seven young and two old adults spontaneously included execution-related elements in their plan. Similar figures were found in the general-planning-aid condition: eight young adults versus no old adult. In contrast, in the combined-aid condition, 7 young and 10 old adults included those elements in their plans.

With respect to the initiation component, even though it had not been part of any aid, several participants spontaneously included an element referring to SET initiation in their plans (no-planning-aid condition, 5 young and 4 old adults; general planning aid, 8 young and 2 old adults; combined aid, 4 young and 6 old adults). Both main effects (age group and planning condition), as well as the interaction, did not turn out to be significant.

Plan retention. Plan retention at the midpoint of the experiment was very high across all conditions. The ANOVA revealed no significant effects of age or planning condition.

Delayed SET performance: Initiation component. With respect to the initiation component, the ANOVA revealed no significant main effect of planning condition, nor an interaction with age. However, older adults remembered to initiate the prospective memory task significantly less often than young adults.

Delayed SET performance: Switching component. With respect to the number of self-initiated switches, the ANOVA revealed a significant main effect for planning condition and a significant main effect of age. In addition, there was a significant interaction, indicating that the positive effect of planning occurred only with the combined aid (for both age groups, no aid vs. general aid, ts < 1) and particularly in the older adults (no aid vs. combined

Table 4
Planning and Delayed SET Performance in Experiment 2

	Young Adults						Older Adults						*F* Values		
	No Planning Aid		General Planning Aid		Combined Planning Aids		No Planning Aid		General Planning Aid		Combined Planning Aids				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	Age	Planning Aids	Age × Planning Aids
Plan elaborateness	12.5	5.9	12.4	6.0	12.9	6.4	6.5	4.4	6.6	4.0	13.1	4.8	11.75**	4.25*	3.25*
Plan retention before performance	94.1	16.2	89.6	28.6	91.0	22.2	84.6	31.5	88.5	30.0	91.7	19.5	0.35	0.06	0.31
Initiation	0.80	0.41	0.87	0.35	0.73	0.46	0.27	0.46	0.33	0.49	0.40	0.51	24.31**	0.17	0.50
Switching	4.00	1.20	4.07	1.10	5.00	0.00	1.93	1.49	2.00	0.93	4.40	1.12	48.27**	24.94**	4.64*
Plan retention after performance	91.9	17.6	94.1	16.2	91.0	22.2	88.5	21.9	91.0	22.1	88.9	20.5	0.41	0.14	0.01
Rule recall	96.0	7.4	94.1	11.1	93.9	11.0	90.8	10.2	95.8	7.6	93.5	12.1	0.37	0.19	.86
Plan fidelity	52.8	33.7	85.0	17.6	89.3	14.6	26.7	27.3	86.7	20.1	88.3	17.8	3.13+	43.68**	3.40*

+$p = .08$. *$p < .05$. **$p < .01$.

aid, $t = -5.1$, $p < .001$, $\eta^2 = .49$, vs. $t = -3.2$, $p < .01$, $\eta^2 = .27$, in younger adults). However, there was a clear ceiling effect for young adults in the combined-aid condition as they showed perfect performance. It is noteworthy that older adults' performance in the combined-aid condition (4.40) was at the same level as performance of the young adults in both the unaided (4.00) and the general-planning-aid (4.07) conditions.

There were no significant main effects of age or planning condition on the total number of items attempted during the SET subtasks (e.g., picture naming, word finding, etc.), nor a significant interaction.

Plan fidelity. The fidelity with which participants executed their plan was low in the no-planning-aid condition, with young adults following just about 50% of their stated plan and older adults following their plan even less accurately. However, in both aided planning conditions (general aid and combined aid), plan fidelity increased significantly (no aid vs. general aid, $t = -6.7$, $p < .001$; no aid vs. combined aid, $t = -7.3$, $p < .001$). Consequently, the ANOVA revealed a main effect of age that approached significance, a reliable main effect of planning condition, and a significant interaction between planning condition and age, indicating that older adults' plan fidelity profited more from the planning aids (for younger adults, no aid vs. general aid, $t = -3.3$, $p < .01$, $\eta^2 = .28$; no aid vs. combined aid, $t = -3.9$, $p < .01$, $\eta^2 = .35$; for older adults, no aid vs. general aid, $t = -6.9$, $p < .001$, $\eta^2 = .63$; no aid vs. combined aid, $t = -7.3$, $p < .001$, $\eta^2 = .66$). The two planning conditions did not significantly differ in their effect on plan fidelity ($t < 1$). In addition, plan fidelity was significantly related to switching performance ($r = .50$, $p < .01$).

Final plan recall. The pattern of high retention that was obtained at the midpoint of the experiment was also obtained for final plan recall. In addition, rule recall at the end of the experimental session was high, with no effects of age, planning condition, or an interaction.

Discussion

Extending Experiments 1A and 1B, we found several differential effects of the general and the combined planning aid on realization of delayed intentions across the various SET phases. The major finding was that for the first time using the present modified SET, a task manipulation has actually improved older adults' performance to a level equal to that found with young adults (cf. Kliegel, Eschen, et al., 2004; Kliegel et al., 2002; Kliegel et al., 2000; Martin et al., 2003). One might argue that the interpretation of this finding is limited by a ceiling effect in the combined-aid condition in the younger adults. Comparing older adults' performance in the combined-aid condition with younger adults' performance in the no aid and the general-planning-aid condition, however, clearly revealed that older adults with appropriate aids perform at levels equivalent to those possible for young adults with either no or a general planning aid. Accordingly, the combination of a general aid to structure planning and an aid that specifies the critical prospective cue in the action plan appears to be a fruitful technique to eliminate the disad-

vantage of older adults relative to young adults in a challenging switching activity.

Several additional findings help to further characterize this result. First, the high levels of plan retention and the absence of age differences therein can now rule out the possibility that differential retrospective memory for the plan might have been responsible for the effects of age or planning condition. Second, the plan elaborateness analysis revealed that young adults' plan formation did not profit from the provided aids, whereas older adults' plan formation was enhanced in the combined-aid condition. Plan formation of older adults was also enhanced in the planning-aid condition in Experiments 1A and 1B, yet they did not reach the levels of switching performance displayed by young adults. Why did the present combined-aid condition manage to raise older adults' prospective switching performance to the levels found with young adults in the unaided and general-aid conditions? The answer seems to rest with increased plan fidelity: The general planning aid—though it did not improve plan elaborateness—did improve plan fidelity, and the correlation between plan fidelity and switching performance was significant. Based on results from the planning literature it seems plausible that general planning aids such as flow charts may facilitate the structuring and thereby the representation of plans even after delays (e.g., Friedman et al., 1987). In consequence, the results are in line with the hypothesis that age-related deficits in delayed realization of complex intentions may be overcome with planning aids that target both plan elaborateness and plan fidelity.

GENERAL DISCUSSION

One primary finding of the present research was that intention planning directly affects delayed performance in the applied modified SET. Providing participants with appropriate planning aids led to better prospective memory performance in both young and older adults. This finding supports theoretical proposals that assume an influence of planning in prospective memory (e.g., Ellis, 1996; McDaniel & Einstein, 2000). This finding also dovetails with less direct results from neuropsychological studies (e.g., Burgess & Shallice, 1997; Shallice & Burgess, 1991) and from correlational analyses relating prospective memory performance and planning measures (e.g., Kliegel et al., 2000). In addition, as planning has been considered an executive function (e.g., Burgess et al., 2000), the finding is consistent with recent attempts to link prospective memory to executive functions, particularly with respect to age differences (e.g., Glisky, 1996; Martin et al., 2003).

Second, a conclusion regarding the effect of planning in this study is that planning aids can be designed to improve distinct actions in complex prospective memory. For instance, only when planning aids targeting the initiation component were explicitly included in the provided planning aids, did planning improve initiation of the prospective task set (Experiments 1A and 1B). Similarly, prompting people to plan the switching (but not the initiation) of the complex prospective memory paradigm led to better performance in the switching but not in the initiation component (Experiment 2).

The present study revealed age-related differences in the contents of the plans participants generated to help them perform the prospective memory task (see West, Herndon, & Covell, 2003, for converging results applying a psychophysiological approach). There is reason to believe that these differences are an important factor underlying age-related declines in prospective memory performance in multitask situations like the present task. First, older adults' complex prospective memory performance, both in terms of the switching component (Experiments 1A, 1B, and 2) and initiating the task set (Experiments 1A and 1B), was significantly improved when they were given guidance in constructing effective plans. The guidance of the task-specific aids appeared to operate at the planning stage, as the plan content measures indicated that older adults' plans were generally modified in accordance with the experimenter-provided hints.[2]

However, even when older adults' deficits in plan content were shown to be remedied in Experiments 1A and 1B, there still were reliable age differences in delayed performance. Thus, the results point to the importance of other plan-related factors in order to better understand age-related decline in complex prospective memory performance. Accordingly, we considered the possibility that plan retention or plan fidelity or both were also involved in the observed age differences. There was no evidence however that deficient plan retention played a role in the persisting age effects in prospective memory performance Experiments 1A, 1B, and 2).

Plan fidelity, beside plan elaborateness, did emerge as a second critical component of the obtained age effects. Evidence that plan fidelity is linked to age differences in delayed performance was most strongly provided by Experiment 2: Besides the significant relation between fidelity and switching, performance of the older participants substantially improved when the planning aids enhanced plan fidelity, specifically by adding the general planning aid to the task-specific planning aids. The more general idea that may be concluded from these findings is that in complex prospective memory, besides formulating a good plan, one must also follow that plan successfully—which in turn seems more likely when a person has structured his or her plan (see Friedman et al., 1987). However, it has to be noted that when considering all three experiments, older adults seem to rely more on the need to actually follow their plans while younger adults appear to be able to perform well even when abandoning their initial plan (which may reflect spontaneous but functional adaptation of the plan). Further empirical work will have to disentangle possible differential age-related effects in the interplay of preplanning and spontaneous reorganization of complex intentions in complex prospective memory.

Although we have argued that planning should help prospective memory, it might not always be an effective strategy. For example, having to remember to perform one simple activity in an event-based laboratory task (e.g., to press a button) may not necessarily profit from planning, because one's intention—at least according to

some views—might simply "pop into mind" more or less automatically once the cue to retrieve it is encountered. Furthermore, planning might be dysfunctional when important aspects of the retrieval context are unpredictable or unknown, and/or beyond a person's control. However, planning is likely to help prospective remembering when the task is (1) predictable, (2) controllable, and to some degree (3) complex.

One methodological issue needs to be addressed. In the present study, in order to assess the content of the participants' plans, it was necessary that they plan out loud. Formulating plans aloud, however, may influence prospective memory performance, for instance by changing plan elaborateness or increasing commitment to perform the task. Therefore, to better approximate everyday planning, future replications should consider the possible impact of the think-aloud method. This could clarify the remaining question as to whether clear instructions to formulate plans (quietly) yield comparable results. However, in all three experiments, plan elaborateness was significantly related to delayed switching performance, suggesting that the complexity of the plan is associated with delayed performance. Thus, developing a specific and complex plan that contains more than just repeating task instructions seems to be beneficial. However, without explicit testing, the alternative hypothesis remains that instructing participants to think about when exactly they would switch between tasks (instead of providing a predefined cue) may suffice.

Our findings add to the aging and cognitive training literature showing that applying interventions on a rather basic level can improve older adults' performance (cf. Kliegl, Smith, & Baltes, 1989; Schaie & Willis, 1986). From an applied perspective, this finding has important implications for the conceptualization of intervention programs regarding prospective memory in the aging (and potentially also clinical) populations. So far, only few studies have addressed the issue of improving prospective memory performance in normal aging and neuropsychological patients (e.g., Andrewes, Kinsella, & Murphy, 1996; Villa & Abeles, 2000). The present experiments provide empirical evidence favoring the inclusion of a planning component in prospective memory intervention programs. In the light of these experiments, it seems reasonable to train older people how to specifically plan what they intend to do in the future, as well as how to implement their plans by helping them to structure their intentions (see Kliegel, 2004, for an application in patients with diabetes mellitus).

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NOTES

1. Analyzing categorical variables with chi-square tests did not change the results.

2. Plan content analyses may also help in addressing differences in no-planning groups' initiation performance levels between Experiments 1A and 1B and Experiment 2 (with Experiment 2 showing elevated performance levels). When comparing the spontaneous inclusion of initiation-related if–then plans in the no-planning conditions, consistent with the elevated performance, also inclusion of if–then elements were elevated in Experiment 2 (we thank Rebekah Smith for highlighting this issue). Nevertheless, at present, one can only speculate as to why there was more spontaneous initiation-related planning in Experiment 2; one reason may be that the sample in Experiment 2 was somewhat higher educated than those of Experiments 1A and 1B (for which comparable levels of initiation performance and spontaneous planning were found).

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